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ORIGINAL RESEARCH

Clinico-Microbiological Assessment On Necrotizing Otitis Media In Subjects With Diabetes Mellitus

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Abstract

Background: Otitis externa is an inflammatory infection of the external ear canal that might lead to a very severe disease namely necrotizing otitis externa (NOE). However, existing literature data is scarce in the Indian scenario for NOE.

Aim: The present study aimed to assess the clinic-microbiological profile of subjects with necrotizing otitis media in subjects with diabetes mellitus (DM).

Methods: The present study assessed 60 subjects who had confirmed diagnosis of otitis externa with diabetes mellitus. In all the included subjects, clinical picture and microbiological profile were assessed on the collected samples. The data gathered were analyzed statistically for results formulation.

Results: The studyresults showed that among 60 subjects assessed in the study, there were 36 male and 24 female subjects that had diabetes mellitus with otitis externa. The mean age of the study subjects was 60.51±9.6. In all the study subjects, edema of the external auditory canal, otorrhea, and severe night otalgia were seen. In eight cultures, no growth was seen, whereas, in 26 subjects, pus culture showed pseudomonas sp. And 10 subjects showed mild conductive hearing loss. In 4 among 60 subjects, two subjects had facial nerve involvement leading to facial nerve palsy, and the other two depicted facial nerve palsy with glossopharyngeal nerve injury on CT (computed tomography) findings.

Conclusions: The present study concludes that necrotizing otitis externa is common in subjects with diabetes mellitus mainly in subjects aged 60-80 years. The most common cultured microorganism seen in study subjects was Pseudomonas species.

Keywords: Diabetes mellitus, Otitis externa, necrotizing otitis externa, pseudomonas, pus

Introduction

OE (otitis externa) also known as tropical ear or swimmer's ear represents a disease that includes inflammation and infection of the external ear canal. Otitis externa can be in the range of mild inflammation to a very severe disease process which is known as NOE or necrotizing otitis externa. NOE is caused by a break in cerumen or skin protective barrier in the external ear canal usually seen in conditions with warmer temperatures and increased humidity. Three clinical stages of otitis externa are identified namely: chronic, acute-inflammatory, and pre-inflammatory.[1]

The pre-inflammatory stage is seen from local trauma or moisture in the ear canal. The skin becomes edematous and obliterates the glands. This obliteration predisposes the ear to further trauma. The acute inflammatory stage of otitis externa can be classified as mild, moderate, and severe stages. In the mild acute inflammatory stage, the canal is edematous and erythematous and leads to the development of clear odorless secretions.[2] Moderate acute inflammatory otitis externa has increased pain and edema and secretions are seropurulent. Severe inflammatory OE is intensely painful and includes a lumen obliterated by debris and draining secretions. It is usually seen

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along with adenopathy and periauricular edema. When the infection reaches surrounding tissues, it is known as necrotizing otitis externally. Chronic otitis externa is a single episode of more than 4 weeks/4 or more episodes in a year.[3] Diabetes is considered a vital risk factor for different bacterial infections. Necrotizing otitis externa is a potentially deadly infection of the skull base, external ear canal, and accompanying soft tissues. Osteomyelitis in temporal bone linked to necrotizing otitis externa was first introduced in 1838. Existing literature data has reported cases of osteomyelitis of acute skull base in diabetics having purulent discharge and auricular necrosis.[4]

Organism Bacillus Pyocyaneus also known as Pseudomonas aeruginosa was first reported which was later replaced by the term malignant to reflect the grim outcome of the condition. However, few existing literature studies have used the term necrotizing or invasive otitis externa to pose the fact that necrotizing otitis externa is not a neoplasm. The term otomycosis is usually used to describe fungal infections from the external ear including the middle ear, eardrum, auditory canal, and auricle. Invasive necrotizing otitis externa is an external auditory canal infection that invades the mastoid cells and base of the skull.However, existing literature data is scarce in the Indian scenario for NOE.[5]The present study aimed to assess the clinic-microbiological profile of subjects with necrotizing otitis media in subjects with diabetes mellitus (DM).

Materials and methods

The present prospective observational clinical study was aimed to assess the clinic-microbiological profile in subjects with necrotizing otitis media in subjects with diabetes mellitus (DM). The study subjects were from the Department of ENT and General Medicine of the Institute. Verbal and written informed consent were taken from all the subjects before participation.

The study assessed all the subjects who were diagnosed with otitis externa and diabetes mellitus and presented to the Institute within the defined study period. The diagnosis of otitis externa was made using the clinical findings and necrotizing otitis external diagnosis was made with both radiographic and clinical findings based on obligatory/major and occasional/minor diagnostic criteria. Necrotizing otitis externa was diagnosed if all the major criteria were seen. The data assessed in the study subjects was gender, age, comorbidities, and cranial nerve involvement using Brackman score for grading of facial nerve. The study also assessed critical lab test values including ESR (erythrocyte sedimentation rate), CRP (C- -reactive protein), WBC (white blood cell) count, HbA1c (glycated hemoglobin) levels, and blood glucose levels. The imagining techniques that have been used include HRCT (high-resolution computed tomography) when indicated. Subjects with diabetes were assessed in the study based on their medical history. In all the subjects, cleaning of the external auditory canal was done along with a microscopic examination. In all the subjects, cultures were collected. In all the subjects, topical and systemic antibiotic therapy was given which was modified based on the swab culture and histological findings results. In all the subjects, oral antibiotic therapy was given for a minimum of 6 weeks after discharge from the hospital. The data gathered were analyzed statistically using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) for assessment of descriptive measures, Student t-test, ANOVA (analysis of variance), Mann-Whitney U test and Chi-square test. Pearson correlation coefficient was used to assess correlation in various parameters. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered.

Results

The present prospective observational clinical study was aimed to assess the clinic-microbiological profile in subjects with necrotizing otitis media in subjects with diabetes mellitus (DM). The present study assessed 60 subjects who had confirmed diagnosis of otitis externa with diabetes mellitus. There were 60% (n=36) males and 40% (n=24) females in the present study. No study subject was in the age range of 21-30 and 31-40 years, 20% (n=12), 26.66% (n=16), 33.33% (n=20), and 0 subjects in 41-50, 51-60, 61-70, 71-80, and 81-90 years of age respectively (Table 1). It was seen that for pus culture in study subjects, no growth was seen in 13.33% (n=8) of study subjects. The highest number of organisms were seen as pseudomonas species in 43.33% (n=26) study subjects followed by staphylococcus species in 16.66% (n=10) study subjects, streptococcus species, and candida species in 10% (n=6) study subjects, and Klebsiella species in 6.66% (n=4) study subjects respectively (Table 2). The study results showed that for PTA (pure tone audiometry) in study subjects, it was seen that mild CHL (conductive hearing loss) was seen in 16.66% (n=10) study subjects, and normal hearing on pure tone audiometry was seen in 83.33% (n=50) subjects (Table 3).

Concerning the assessment of the laboratory data in the study subjects, mean blood glucose, HbA1C, CRP (C-reactive protein), WBC (white blood cells), and ESR (erythrocyte sedimentation rate) was 174.87±40.06, 7.34±1.22, 44.384±18.92, 7545±1001, and 71.064±19.17 respectively (Table 4).

S. No	Characteristics	Number (n)	Percentage (%)
1.	**Gender**		
a)	Males	36	60

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b)	Females	24	40
2.	**Age range (years)**		
a)	21-30	0	0
b)	31-40	0	0
c)	41-50	12	20
d)	51-60	16	26.66
e)	61-70	20	33.33
f)	71-80	12	20
g)	81-90	0	0

Table 1: Demographic data of study subjects at baseline

S. No	Organism growth	Number (n)	Percentage (%)
1.	**No growth**	8	13.33
2.	**Klebsiella sp.**	4	6.66
3.	**Candida sp.**	6	10
4.	**Streptococcus sp.**	6	10
5.	**Staphylococcus sp.**	10	16.66
6.	**Pseudomonas sp.**	26	43.33

Table 2: Pus culture reports in the study subjects

S. No	PTA (Pure tone audiometry) test	Number (n)	Percentage (%)
1.	**Mild CHL (conductive hearing loss)**	10	16.66
2.	**Normal hearing**	50	83.33

Table 3: Hearing evaluation in the study subjects

S. No	Parameter	Minimum	Maximum	Mean ± S. D
1.	**Laboratory investigations**			
a)	Blood glucose	134.79	214.95	174.87±40.06
b)	HbA1c	6.10	8.4	7.34±1.22
c)	CRP	25.43	63.31	44.384±18.92
d)	WBC	6541	8547	7545±1001
e)	ESR	51.85	90.24	71.064±19.17

Table 4: Laboratory data on study subjects

Discussion

The present study assessed 60 subjects who had confirmed diagnosis of otitis externa with diabetes mellitus. There were 60% (n=36) males and 40% (n=24) females in the present study. No study subject was in the age range of 21-30 and 31-40 years, 20% (n=12), 26.66% (n=16), 33.33% (n=20), and 0 subjects in 41-50, 51-60, 61-70, 71-80, and 81-90 years of age respectively. These data were comparable to the previous studies of Chen JC et al[6] in 2014 and Kaya İ et al[7] in 2018 where authors assessed subjects with demographic data comparable to the present study with otitis externa and diabetes mellitus in their respective studies.

The study results showed that for pus culture in study subjects, no growth was seen in 13.33% (n=8) of study subjects. The highest number of organisms were seen as pseudomonas species seen in 43.33% (n=26) study subjects followed by staphylococcus species in 16.66% (n=10) study subjects, streptococcus species and candida species in 10% (n=6) study subjects, and Klebsiella species in 6.66% (n=4) study subjects respectively. These results were consistent with the findings of Ravikumar A et al[8] in 2017 and Rubin Grandis J et al[9] in 2004 where pus culture data reported by the authors in their studies was comparable to the results of the present study.

It was seen that for PTA (pure tone audiometry) in study subjects, it was seen that mild CHL (conductive hearing loss) was seen in 16.66% (n=10) study subjects, and normal hearing on pure tone audiometry was seen in 83.33% (n=50) subjects. These findings were in agreement with the results of Rajput MS et al[10] in 2013 and Stern Shavit S et al[11] in 2016 where PTA (pure tone audiometry) results similar to the present study were also reported by the authors in their respective studies.

The study results showed that concerning the assessment of the laboratory data in the study subjects, mean blood glucose, HbA1C, CRP (C-reactive protein), WBC (white blood cells), and ESR (erythrocyte sedimentation rate) was 174.87±40.06, 7.34±1.22, 44.384±18.92, 7545±1001, and 71.064±19.17 respectively. These results correlated with the findings of Yang TH et al[12] in 2020 and Guerrero-Espejo A et al[13] in 2017 where laboratory data reported by the authors in their respective studies were comparable to the results of the present study.

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Conclusions

Considering its limitations, the present study concludes that necrotizing otitis externa is common in subjects with diabetes mellitus mainly in subjects aged 60-80 years. The most common cultured microorganism seen in study subjects was the Pseudomonas species. However, the study followed a lesser number of subjects over a shorter period. Hence, further clinical studies with larger sample sizes and longer follow-ups are needed to attain a definitive conclusion.

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